WHAT IS CLAIMED:

1. A method for providing congestion control in a communications network, the method comprising the steps of:

(a) transmitting a plurality of serial data transmission from a source node to a destination node;

(b) determining whether a congestion occurs in said network;

(c) determining a bandwidth capacity of said network;

(d) adjusting a sender rate at which said source is currently transmitting the data according to a first predetermined criterion if no congestion occurs; and,

(e) adjusting said sender rate of said source node according to a second predetermined criterion if congestion occurs.

2. The method of claim 1, wherein said adjusting step (d) according to said first predetermined criterion includes increasing the number of packets transmitted by said source node.

3. The method of claim 1, wherein said adjusting step (e) according to said second predetermined criterion includes decreasing the number of packets transmitted by said source node.

4. The method of claim 1, wherein said adjusting step (d) according to said first predetermined criterion comprises the steps of:

increasing said sender rate by a specified amount at which said source node is currently transmitting the data; and,

returning said sender rate to a linear rate when a predetermined percentage of said bandwidth is utilized within said network.

5. The method of claim 1, wherein said adjusting step (e) according to said second predetermined criterion comprises the step of decreasing said sender rate by a specified amount at which said source node is currently transmitting the data.

6. The method of claim 1, wherein any adjustment of said sender rate operates to establish a maximum data transmission rate and constant packet loss.

7. The method of claim 1, wherein any said predetermined criterion of said adjusting step provides faster convergence to a stable operation.

8. The method of claim 1, wherein said data flow from said source node is simultaneously transmitted to multiple destination nodes, and said bandwidth capacity is determined for each said data flow transmitted to each of said multiple destination nodes.

9. A method for providing congestion control in a communications network, the method comprising the steps of:

(a) transmitting a plurality of serial data transmission from a source node to a destination node;

(b) monitoring a sending rate at which said source node is currently transmitting data to said network and a current rate at which said destination node is currently receiving data to determine whether a congestion state occurs; and,

if a congestion state occurs, decreasing said sender rate of said source node according to a first predetermined criterion if congestion occurs;

if no congestion state occurs, determining the bandwidth capacity of said network; and,

increasing said sender rate of said source node according to a second predetermined criterion if no congestion occurs.

10. The method of claim 9, wherein said decreasing step according to said first predetermined criterion comprises the step of decreasing said sender rate by a specified amount at which said source node is currently transmitting the data.

11. The method of claim 9, wherein said increasing step according to said second predetermined criterion comprises the steps of:

increasing said sender rate by a specified amount at which said source node is currently transmitting the data; and,

returning said sender rate to a linear rate when a predetermined percentage of said bandwidth is utilized within said network.

12. The method of claim 9, wherein said increase and decrease of said sender rate operates to establish a maximum data transmission rate and constant packet loss.

13. The method of claim 9, wherein said first and second predetermined criteria of said increasing and decreasing steps provide faster convergence to a stable operation.

14. The method of claim 9, wherein said data flow from said source node is simultaneously transmitted to multiple destination nodes, and said bandwidth capacity is determined for each said data flow transmitted to each of said multiple destination nodes.

15. The method of claim 9, wherein a congestion state occurs if the rate permitted by said destination node exceeds the capacity of said source node.

16. The method of claim 9, wherein said steps of increasing and decreasing said sender rate above and below an operating point for said network provide a maximum throughput at minimum delay time.

17. The method of claim 9, wherein the step of decreasing said sender rate (f_D (x_i)) according to said first predetermined criterion is determined according to the following equation:

$$x_{i+1} = x_i - \beta x^l \quad \text{and} \quad \beta = 1 / \ mC^{l-1},$$

wherein x_{i+1} represents the next sending rate of data; x_i represents said current sending rate during cycle i; C represents the bandwidth capacity of said network, l represents a constant value greater than one; and, the value m ranges between $2 \leq m \leq 8$.

18. The method of claim 9, wherein the step of decreasing said sender rate according to said second predetermined criterion is determined according to the following equation:

$$x_{i+1} = x_i + \alpha x^{-k} \quad \text{and}$$

$$\alpha = \frac{C^{k+1}}{D},$$

wherein x_{i+1} represents the next sending rate of data; x_i represents said current sending rate during cycle i; C represents the bandwidth capacity of said network, k represents a constant value less than one; and, the value D ranges between $5 \leq D \leq 20$.

19. A system for providing congestion control in a communications network by adjusting a sender rate between at least one sender node and destination node, comprising:

means for transmitting a plurality of data transmission from said source node to said destination node;

means for determining a bandwidth capacity of said network;

means for generating congestion feedback information based on the bandwidth capacity of said network to determine a congestion state; and,

means for adjusting said sender rate at which said source node is currently transmitting the data based on said congestion feedback information and the bandwidth capacity of said network.

20. The system of claim 19, further comprising means for utilizing said congestion feedback information to determine the congestion state in said network.

21. The system of claim 19, wherein said generating means comprise means for monitoring said sending rate at which said source node is currently transmitting data to said network and a current rate at which said destination node is currently receiving data to generate said congestion control information.

22. The system of claim 19, wherein, if no congestion occurs, said adjusting means increase the number of packets transmitted by said source node at a first rate and at a second rate if a predetermined range of the bandwidth capacity of said network is utilized.

23. The system of claim 19, wherein said adjusting means decrease the number of packets transmitted by said source node at a predetermined rate if congestion occurs.

24. The system of claim 19, wherein said adjusting means operate to establish a maximum data transmission rate and constant packet loss.

25. The system of claim 19, wherein said congestion feedback information is provided by at least one of said source node and said destination node.

26. A system for providing a congestion control in a communications network by adjusting the sender rate between a sender node and a destination node, comprising:

a memory for storing a computer-readable code; and,

a processor operatively coupled to said memory, said processor configured to:

(a) transmit a plurality of serial data transmissions from said source node to said destination node;

(b) determine whether a congestion state occurs in said network;

(c) determine a bandwidth capacity of said network;

(d) adjust said sender rate at which said source node is currently transmitting the data according to a first predetermined criterion if no congestion occurs; and,

(e) adjust said sender rate of said source node according to a second predetermined criterion if congestion occurs.

27. The system of claim 26, wherein said adjusting step (d) according to said first predetermined criterion includes increasing the number of packets transmitted by said source node.

28. The system of claim 26, wherein said adjusting step (e) according to said second predetermined criterion includes decreasing the number of packets transmitted by said source node.

29. The system of claim 26, wherein said adjusting step (d) according to said first predetermined criterion comprises the steps of:

increasing said sender rate by a specified amount at which said source node is currently transmitting the data; and,

returning said sender rate to a linear rate when a predetermined percentage of said bandwidth is utilized within said network.

30. The system of claim 26, wherein said adjusting step (e) according to said second predetermined criteria comprises the step of decreasing said sender rate by a specified amount at which said source node is currently transmitting the data.

31. The system of claim 26, wherein any adjustment of said sender rate operates to establish a maximum data transmission rate and constant packet loss.

32. The system of claim 26, wherein any said predetermined criterion of said adjusting step provides faster convergence to a stable operation.

33. A machine-readable medium having stored thereon data representing sequences of instructions, and the sequences of instructions which, when executed by a processor, cause the processor to:

transmit a plurality of serial data transmissions from a source node to a destination node;

monitor a sending rate at which said source node is currently transmitting data to said network and a current rate at which said destination node is currently receiving data to determine whether a congestion state occurs;

if a congestion state occurs, decrease said sender rate of said source node according to a first predetermined criterion if congestion occurs;

if no congestion state occurs, determine the bandwidth capacity of said network; and,

increase said sender rate of said source node according to a second predetermined criterion if no congestion occurs.

34. The machine-readable medium of claim 33, wherein said increase and decrease of said sender rate operate to establish a maximum data transmission rate and constant packet loss.

35. The machine-readable medium of claim 33, wherein said first and second predetermined criteria of said increasing and decreasing steps provide faster convergence to a stable operation.

36. The machine-readable medium of claim 33, wherein said data flow from said source node is simultaneously transmitted to multiple destination nodes, and said bandwidth capacity is determined for each said data flow transmitted to each of said multiple destination nodes.

37. The machine-readable medium of claim 33, wherein said steps of increasing and decreasing said sender rate above and below an operating point for said network provide a maximum throughput at minimum delay time.

38. The machine-readable medium of claim 33, wherein the step of decreasing said sender rate ($f_D(x_i)$) according to said first predetermined criterion is determined according to the following equation:

$$x_{i+1} = x_i - \beta x^l \quad \text{and} \quad \beta = 1 / \; mC^{l-1},$$

wherein x_{i+1} represents the next sending rate of data; x_i represents said current sending rate during cycle i; C represents the bandwidth capacity of said network, l represents a constant value greater than one; and, the value m ranges between $2 \leq m \leq 8$.

39. The machine-readable medium of claim 33, wherein the step of decreasing said sender rate according to said second predetermined criterion is determined according to the following equation:

$$x_{i+1} = x_i + \alpha x^{-k} \quad \text{and}$$

$$\alpha = \frac{C^{k+1}}{D} \ ,$$

wherein x_{i+1} represents the next sending rate of data; x_i represents said current sending rate during cycle i; C represents the bandwidth capacity of said network, k represents a constant value less than one; and, the value D ranges between $5 \leq D \leq 20$.